ECE 856: Adaptive Control, Fall 2016 (3 credits)

Instructor:

Prof. Xiaobo Tan, Electrical & Computer Engineering
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Office hours: Wednesdays, 10-11:20am; Fridays, 1:40-3pm

Class Meeting Time & Place:

Tuesdays & Thursdays, 1 - 2:20 pm, 313 Ernst Bessey Hall

Grader:

Abdullah Alfehaid (alfehaid@msu.edu)

Introduction:

Feedback, adaptation and learning are essential elements in biological and engineered systems for dealing with uncertainties. Rigorous understanding of these processes is a subject of continuing study. This is a course on the general principles of adaptive parameter estimation and adaptive control. Questions of convergence, stability, and robustness will be addressed. We will discuss various algorithms and analytical methods central to the subject.

Course Outline:

- Introduction
- Adaptive parameter estimation
- Model reference adaptive control
- Adaptive pole placement control
- Adaptive control with state feedback
- Adaptive control of nonlinear systems

Course Prerequisite:

ECE 851 (Linear Systems and Control) or consent of the instructor. ECE 859 (Nonlinear Systems and Control) will be a plus but not required. Necessary tools from nonlinear control theory will be covered in this course.

Textbook:

Gang Tao, Adaptive Control Design and Analysis, John Wiley & Sons, 2003 (e-copy in D2L).

References:

- I. D. Landau, R. Lozano, M. M'Saad, A. Karimi, Adaptive Control: Algorithms, Analysis and Applications, 2nd edition, Springer, 2011 (e-copy in D2L)
- P. A. Ioannou and J. Sun, Robust Adaptive Control, Prentice-Hall, 1995 (e-copy in D2L)
- M. Krstic, I. Kanellakopoulos, and P. Kokotovic, Nonlinear and Adaptive Control Design, Wiley, 1995
- H. K. Khalil, Nonlinear Systems, Prentice Hall, 3rd edition, 2002

Grading:

- Homework (40%): Homework will be assigned roughly every two weeks
- Mid-term exam (33%): In class, closed-book, one cheat sheet (Letter size, both sides, fonts 10 or above)
- Project report and presentation (27%)